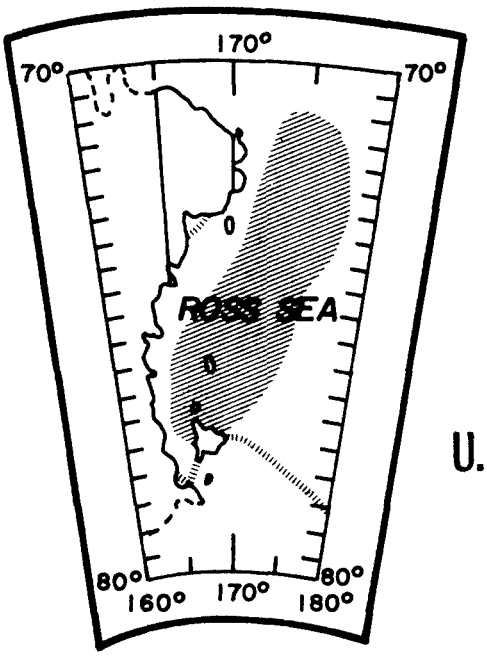
IR NO. 69-75

INFORMAL REPORT

OCEANOGRAPHIC CRUISE SUMMARY ROSS SEA, ANTARCTICA FEBRUARY AND MARCH 1969



OCTOBER 1969

NAVAL OCEANOGRAPHIC OFFICE
WASHINGTON, D. C. 20390

INFORMAL REPORT

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ABSTRACT

The Naval Oceanographic Office conducted an oceanographic survey in the Ross Sea from 25 February to 1 March 1969. Temperature and salinity data were obtained at the annual ice prediction stations along the shipping route to McMurdo and Hallett Stations, Antarctica. Twenty-three stations were taken.

A comparison of 1969 data with data from 1967 and 1968 showed that each 1969 station exhibited approximately the same water structure as in the preceding 2 years, but temperatures were generally colder. Salinities at most stations were slightly lower than in the previous years. Those stations that showed higher salinities were ones at which new ice had already formed or was in the process of forming.

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This report has been reviewed and is approved for release as an UNCLASSIFIED Informal Report.

L. B. BERTHOLF
Director, Nearshore Surveys Division

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I. INTRODUCTION

The Naval Oceanographic Office (NAVOCEANO) conducted an oceanographic survey in the Ross Sea, Antarctica, aboard USCGC BURTON ISLAND (WAGB 283) from 25 February to 1 March 1969 (Operation Number 929021). The objectives of the survey were to obtain temperature and salinity data at the annual ice prediction stations. These stations are located in the Ross Sea along the shipping route to McMurdo and Hallett Stations, Antarctica. The data were necessary for the prediction of sea ice formation and breakup as part of NAVOCEANO's annual Antarctic Ice Prediction Program.

On the 1969 survey, 23 Nansen cast stations were occupied in the Ross Sea (Fig. 1). Table I presents a station summary of the data collected.

II. PREVIOUS KNOWLEDGE OF THE REGION

The following four water masses are present in the western Ross Sea: Antarctic Surface Water, Winter Water, Antarctic Circumpolar Water, and Shelf Water. Antarctic Surface Water is formed during summer due to increased solar radiation which causes warmer temperatures and lower salinities. Winter Water consists of the deeper layers of surface water that are not affected by increased solar radiation. This water maintains most of its characteristics throughout the year. Circumpolar Water is a southward intrusion of warm, saline Antarctic Deep Water into the Ross Sea. Shelf Water is characterized by being the densest, coldest, and most saline water mass in the Ross Sea. The approximate temperature and salinity characteristics of the four water masses are as follows:

*WATER MASS	*TEMPERATURE (°C)	*SALINITY (o/oo)
Antarctic Surface Water	-1.75° to +1.50°	33.50 to 34.50
Winter Water	-1.70° to -1.90°	34.15 to 34.45
Antarctic Circumpolar Water	+1.50° to +0.50°	34.60 to 34.75
Shelf Water	-1.80° to -2.05°	34.75 to 35.00

*(from NAVOCEANO, 1965)

III. METHODS OF COLLECTION AND ANALYSIS

A. Temperature and Depth.

A mechanical bathythermograph (BT) lowering was made at 22 of the stations to learn the existing temperature structure, especially the zones of maximum thermal gradient. Paired deep sea reversing thermometers, attached to Nansen bottles, then were lowered to selected depths to obtain accurate temperature measurements. Accepted temperature values were derived by applying standard corrections and by averaging

the two readings if the values differed by 0.05°C or less. When paired thermometers differed by more than 0.05°C, the reading from the thermometer considered more reliable, based on previous performance, was used. The averaged temperature readings are considered accurate to ±0.02°C. Thermometric depth data from unprotected reversing thermometers, meter wheel readings, and wire angle measurements were used to determine sampling depths.

B. Salinity.

Salinity samples were analyzed aboard ship using a portable Industrial Instruments induction salinometer (Model RS-7A, serial 11861). With this instrument, salinity can be measured with a precision of ±0.003 o/oo. The accuracy of the salinometer was checked by analyzing substandard sea water of known salinity as an unknown and by spotchecking some previously analyzed samples against standard sea water. Based on these checks, salinity values presented in this report are considered accurate to ±0.01 o/oo.

IV. DISPOSITION OF DATA

The Nansen cast temperature and salinity data have been computer processed at the National Oceanographic Data Center (NODC). Computer listings provided temperatures, salinities, densities (sigma-t's), and sound velocities at observed and standard depths. Specific volume and dynamic depth anomalies are given only at standard depths. These listings are on file at NODC under cruise reference number 311342. The BT data are filed at NODC under reference number 69-0275.

V. PRELIMINARY ANALYSIS

Antarctic Surface Water, Shelf Water, and Circumpolar Water were encountered in the 1969 survey as in 1967 and 1968, but Winter Water was not encountered. Temperature and salinity cross sections for each of the five lines of stations are presented in Figures 2 through 6. Antarctic Surface Water was evident at all stations. Shelf Water was observed at all stations except 4, 5, 19, 22, and 23. Circumpolar Water was present only at stations 22 and 23; however, subsurface temperature maxima at stations 18, 19, and 20 (Fig. 5) indicate some influence of this water.

In comparing 1969 data with data from 1967 (Car, 1967) and 1968 (Car and Codispoti, 1968), each 1969 station exhibited approximately the same water structure as in the preceding 2 years, but temperatures were generally colder. Stations 4, 5, and 10 exhibited very slight increases in temperature. The entire water column at station 10 was warmer, station 4 was warmer only at the surface, and station 5 was warmer in the deeper layers. The Antarctic Circumpolar Water intrusion was warmer than in the preceding years, but the other water masses at these stations were colder.

Salinities at most stations were slightly lower than in previous years. Those stations that showed higher salinities were ones at which new ice had already formed or was in the process of forming.

Station 19 and the 1968 station at the same location showed the same characteristic pattern. As indicated by Car and Codispoti (1968), the deeper water at adjacent stations could be in a basin-like area and thus be isolated from free interchange with the deepest water of this station.

The 1969 survey was taken at a later date than the previous surveys, and the austral winter of 1968 was colder and more extreme than other years. These factors may have had some influence on the lower temperatures encountered in 1969.

VI. ADDITIONAL INFORMATION NEEDED

Attempts should be made to obtain ice thicknesses at different localities in McMurdo Sound during the Antarctic winter and spring. Also, more weather information from the Antarctic area, especially storm conditions in the spring, should be obtained and made available to the ice prediction unit at NAVOCEANO. Evidence indicates that ice outflow from the McMurdo Sound area is greatly influenced by the frequency and intensity of spring storms.

VII. BIBLIOGRAPHY

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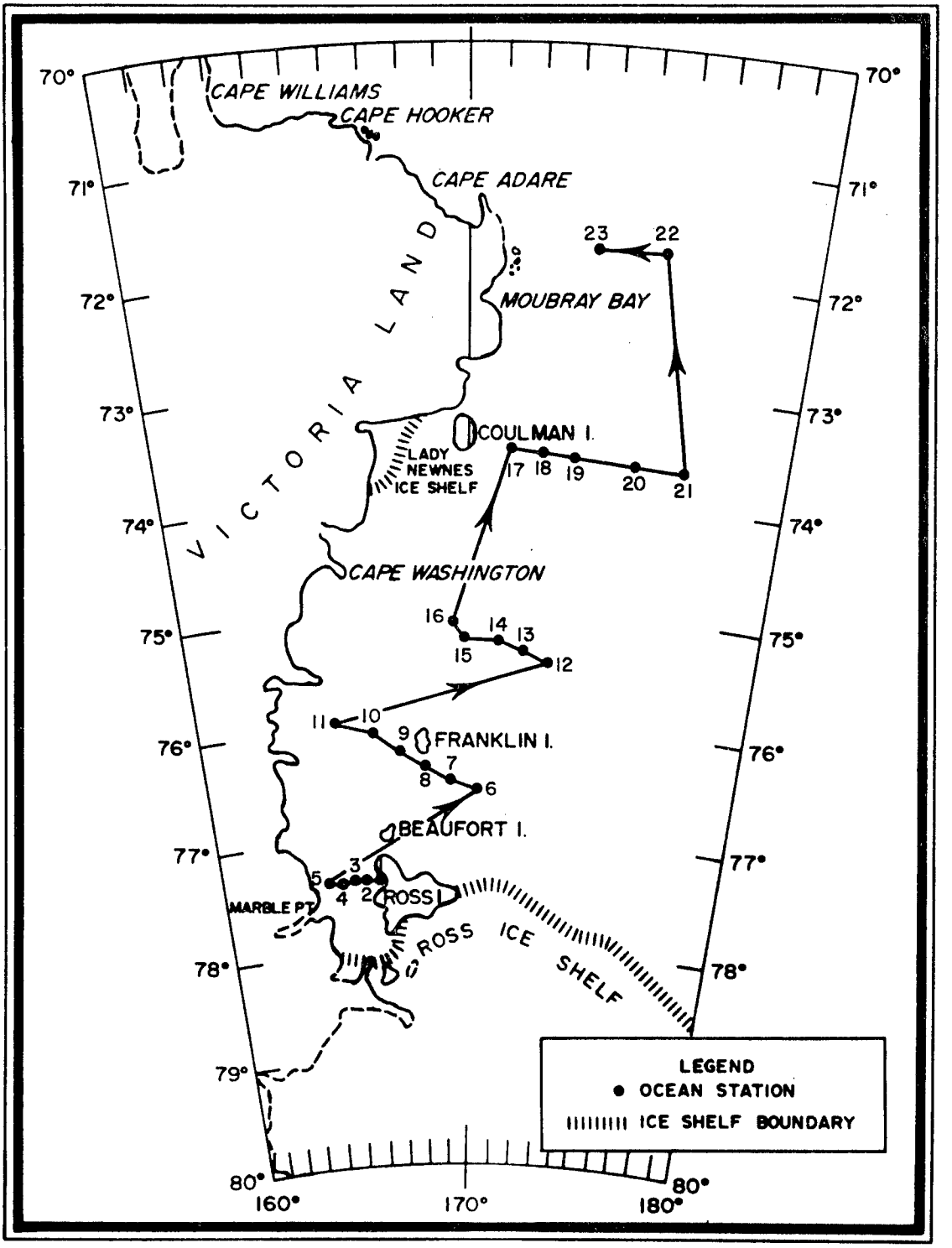

FIGURE 1. Station Locations.

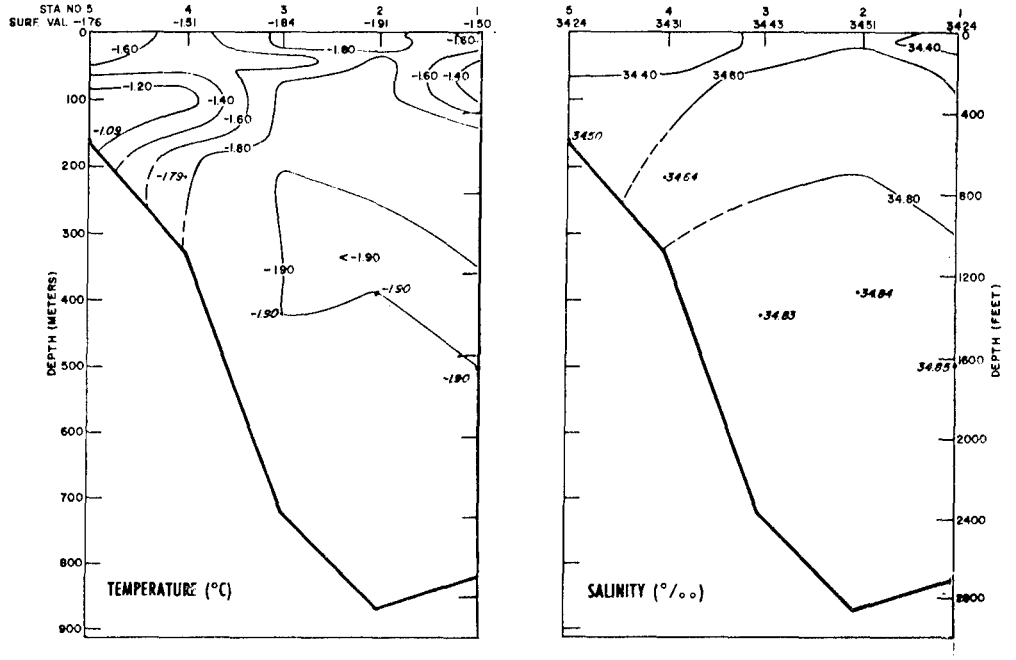

FIGURE 2. Temperature and Salinity Cross Sections - Stations 5 to 1.

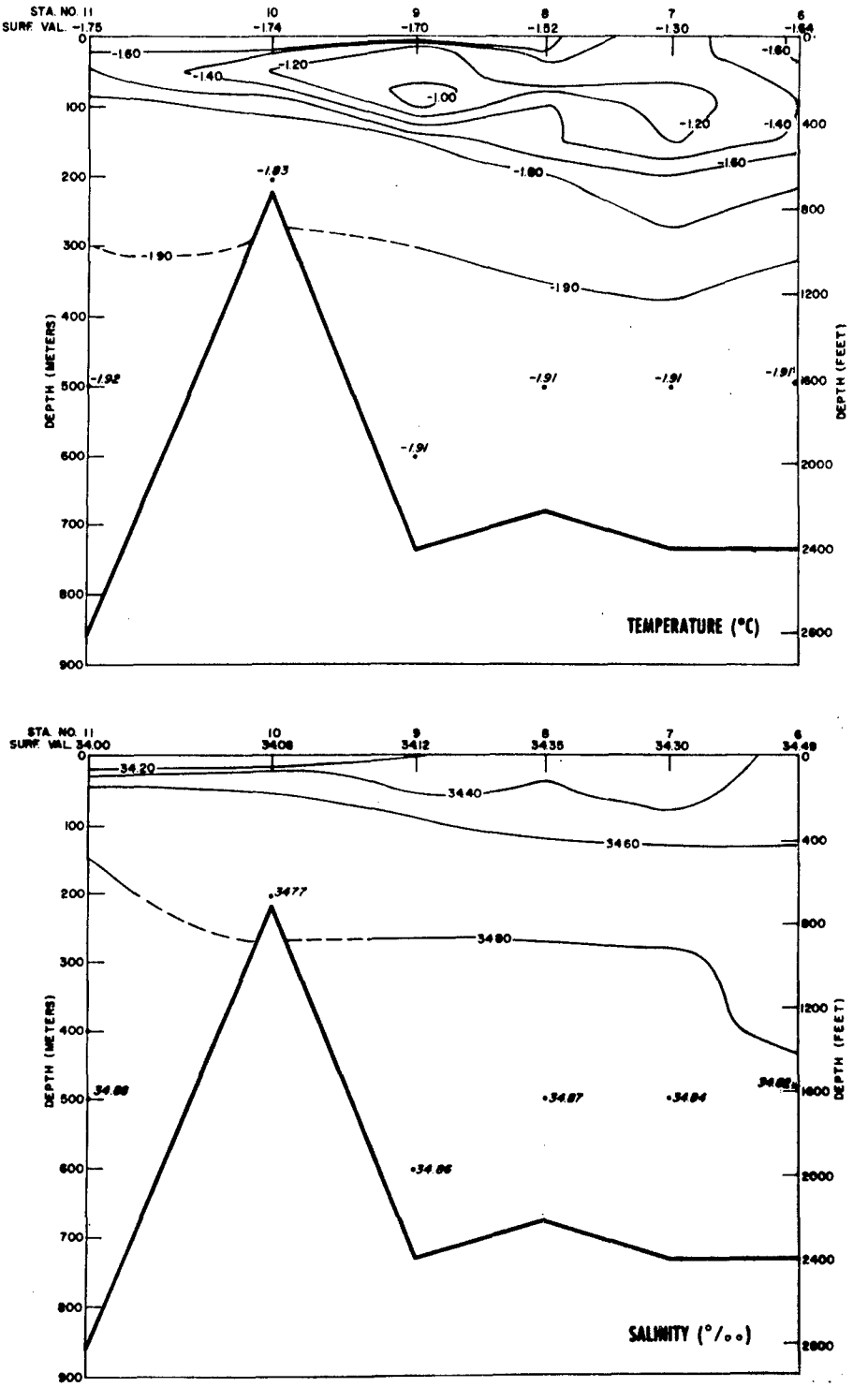

FIGURE 3. Temperature and Salinity Cross Sections - Stations 11 to 6.

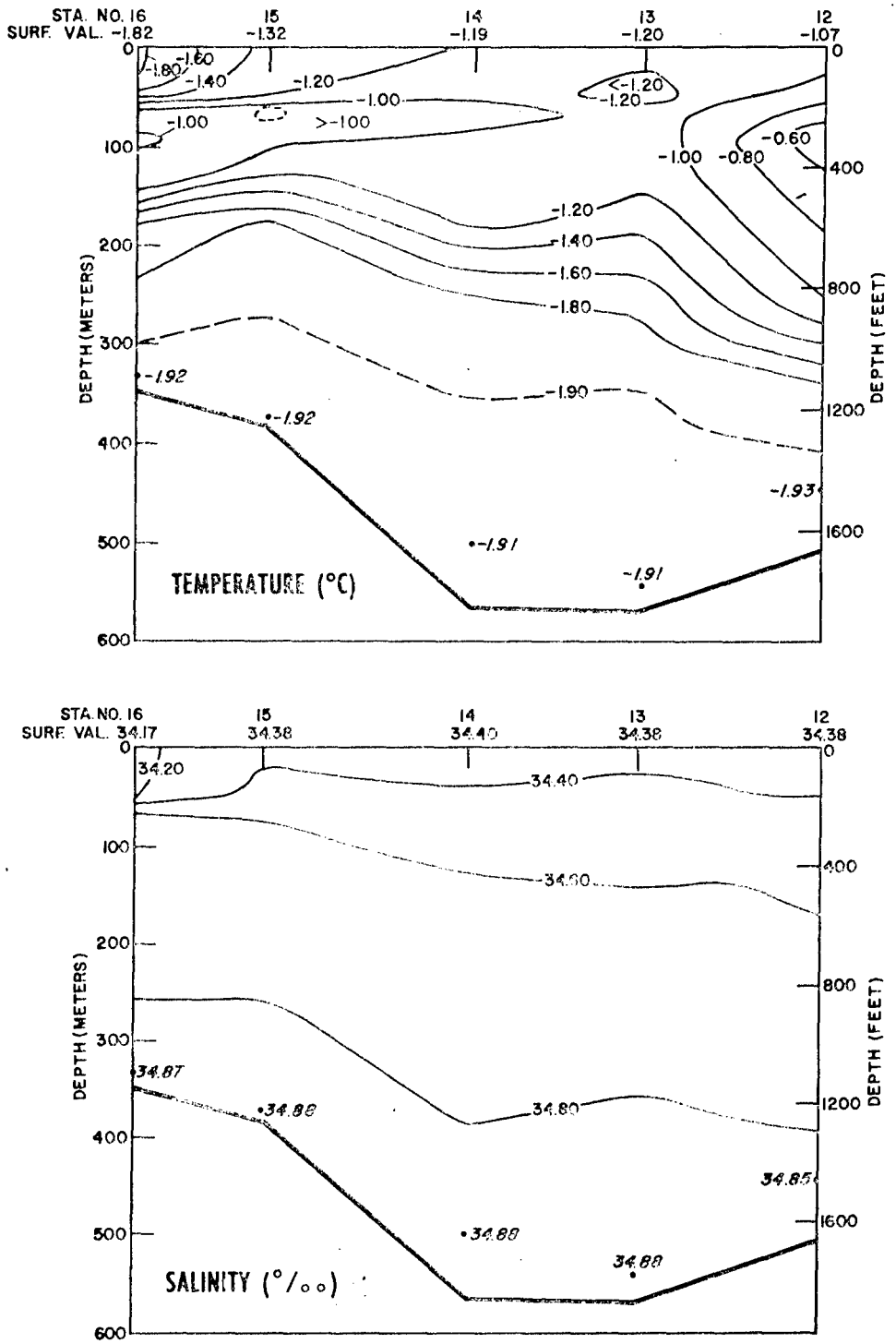

FIGURE 4. Temperature and Salinity Cross Sections - Stations 16 to 12.

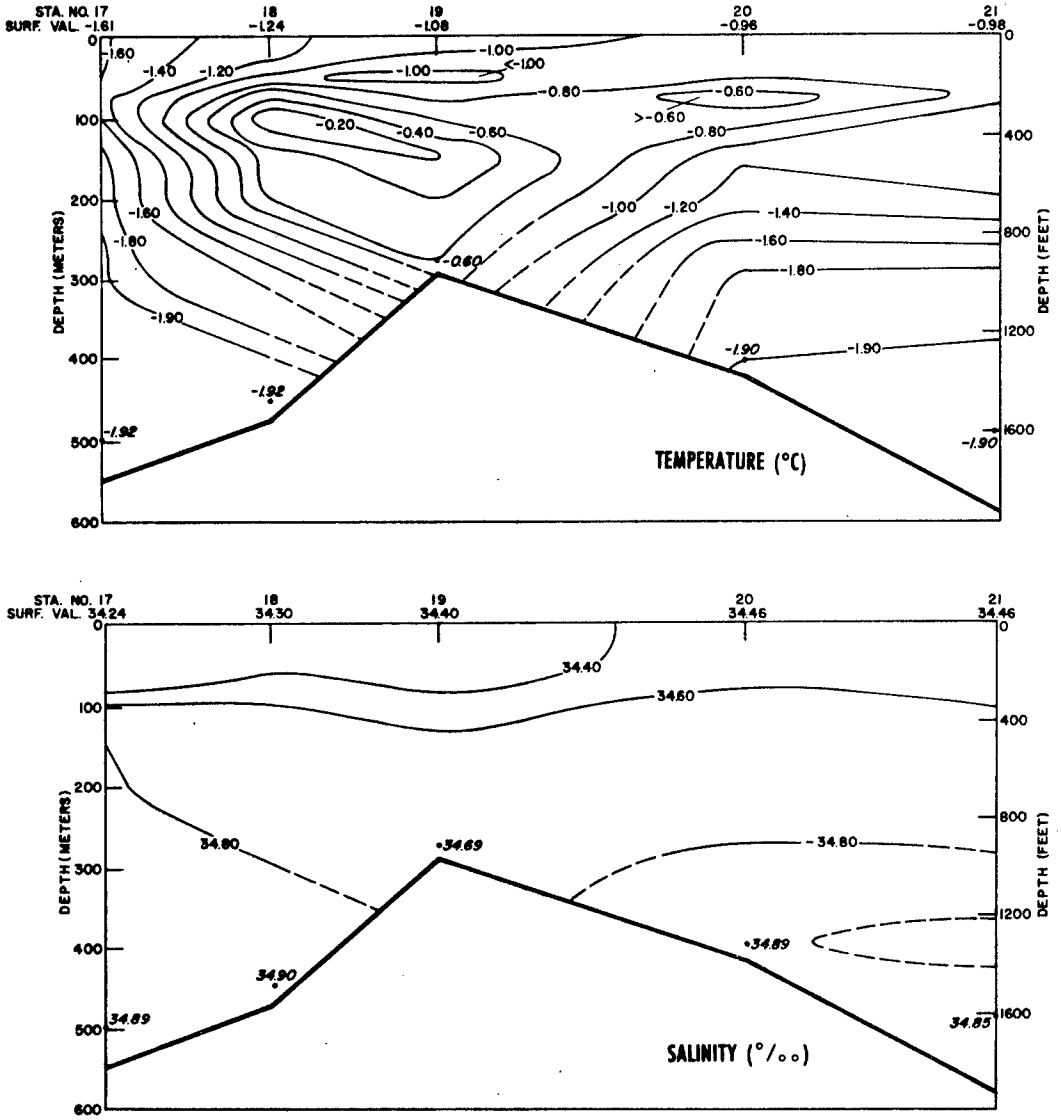

FIGURE 5. Temperature and Salinity Cross Sections - Stations 17 to 21.

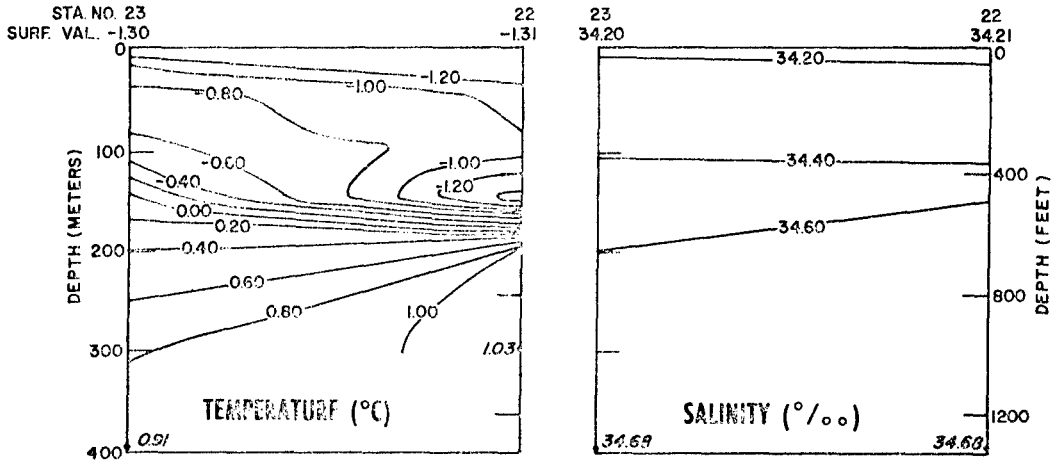

FIGURE 6. Temperature and Salinity Cross Sections - Stations 23 to 22.

TABLE I. OCEANOGRAPHIC STATION SUMMARY

Sta. No.	Latitude °S	Longitude °E	Sonic Depth (Meters)	Cast Depth (Meters)	BT	Salinity and Temperature
1	77°28'	166°10'	823	500	√	√
2	77°27'	165°40'	869	388	√	√
3	77°26'	165°20'	723	423	√	√
4	77°26'	164°50'	329	213	√	√
5	77°24'	164°25'	155	165	√	√
6	76°34'	170°15'	732	482	√	√
7	76°27'	169°15'	732	500	√	√
8	76°20'	168°15'	677	500	√	√
9	76°13'	167°15'	732	600	√	√
10	76°06'	166°15'	220	204	√	√
11	75°55'	165°00'	860	500	√	√
12	75°25'	172°45'	508	445	√	√
13	75°20'	171°55'	570	542	√	√
14	75°15'	171°00'	567	500	√	√
15	75°14'	169°54'	384	372	√	√
16	75°04'	169°25'	348	331		√
17	73°33'	171°20'	549	500	√	√
18	73°35'	172°20'	475	450	√	√
19	73°36'	173°20'	293	275	√	√
20	73°37'	175°05'	420	400	√	√
21	73°38'	176°45'	585	491	√	√
22	71°44'	175°30'	2750	500	√	√
23	71°43'	173°40'	2200	499	√	√

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